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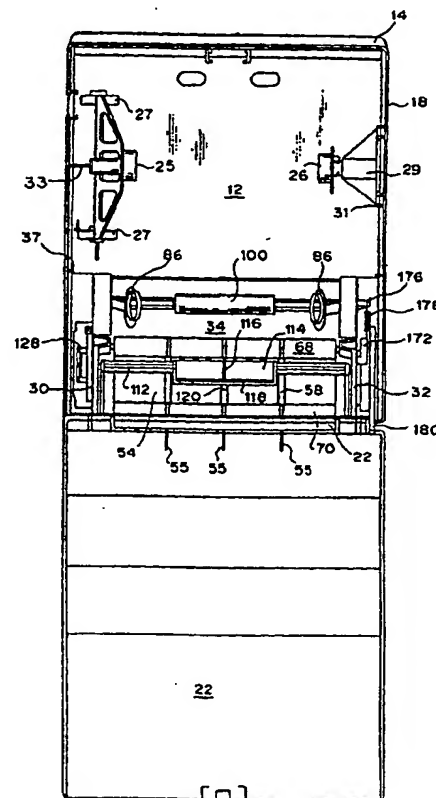
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(54) Title: ROLLED WEB DISPENSER AND CUTTING APPARATUS

## (57) Abstract

A rolled paper towel dispenser having a spring (178) loaded cutting blade geared to rotate in conjunction with a slotted drive drum (54). The blade is shielded by a fixed cowl (34). Guide rollers (68, 70) and the drive drum include threading clips. A brake mechanism ensures that the rolled towel cannot be free spooled. Supports (25, 26, 86) are provided for both a primary roll and a stub roll. Geared sensor arms sense the diameter of the stub roll and when the diameter decreases to a point near the end of the roll, the tail from the primary roll is automatically delivered to the surface of the drive drum and automatically threaded therethrough. To dispense a towel from the dispenser, the user grasps the tail of the towel extending from the dispenser and pulls downward. This drives the drive drum which in turn rotates the cutting blade into position severing the sheet at the proper location.



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## ROLLED WEB DISPENSER AND CUTTING APPARATUS

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention.

The present invention relates generally to dispensing a rolled paper product, and more particularly, to a rolled paper dispenser which automatically severs or partially severs the rolled web into sheets as the web is dispensed.

#### 2. Brief Description of the Prior Art.

There are a number of dispensers known in the prior art for dispensing and cutting paper towels. Many of such dispensers include a serrated edge against which the tail of the rolled paper can be pulled to effect a tear.

Also known in the prior art are apparatus wherein the user pulls the tail of the rolled paper towel and the towel is automatically severed and a pre-determined length as it is dispensed. These dispensers are typically referred to as no-touch dispensers. Examples of these types of apparatus are shown in U.S. Patent No. 4,122,738 and U.S. Patent No. 4,213,363, both to Granger. The apparatus taught in such patents include the rotating drum having a cutting means pivotally mounted within the drum. As the tail of the paper towel is pulled across the drum, the drum is caused to rotate and the rotation of the drum simultaneously rotates a cam which causes the cutting member to pivot out through a slot in the drum and sever the paper towel.

A modification of the above described Granger towel dispensers is disclosed in U.S. Patent No. 4,635,837 also to Granger. The paper towel dispenser described in such patent includes a shaft mounted for free rotation at the lower opening of the dispenser for guiding the paid off web and for preventing unintentional engagements with the users fingers. The shaft is provided with a circumferential groove as is the drum allowing for the resident of a drive belt therein. The rotating drum again includes cutting means pivotally mounted within the drum with such cutting means divided at these two separate half blades to avoid interference with the belt.

U.S. Patent No. 4,712,461 to Rasmussen teaches yet another rolled web dispenser which automatically severs the web at a pre-

determined length when the user pulls on the tail of the rolled web. Rasmussen employs a cutting blade adapted to reciprocate within a rotating drum such that the blade extends through the slot in the drum surface at a pre-determined location. Pins extending from the ends of the blade reside in slots in the end of the drum to govern the direction of the blade movement. A cam follower extending from two of the pins cooperates with a stationary cam to create the reciprocating motion.

Nothing in the prior art teaches a no-touch dispenser wherein the cutting blade is unaccessible even when the cabinet is opened. In such manner, the danger of any one cutting their fingers on the cutting blade even while filling the dispensers with towels is eliminated.

#### SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a rolled web dispensing apparatus wherein when the user pulls a tail of the rolled paper towel, the towel is automatically severed at a pre-determined length leaving several connecting tabs.

It is a further object of the present invention to provide for the safety of users and maintenance personnel by rendering the cutting blade inaccessible even when the cabinet is opened.

It is a further object of the present invention to provide a no-touch dispenser including means to obtain a low activation force delivery system which allows for wet handed dispensing without tab out.

These and numerous other features, objects and advantages of the present invention will become readily apparent upon reading the detailed description, claims and drawings set forth hereinafter. Briefly stated, these features, objects and advantages are accomplished through the use of a perf-type cutting blade which is bent or formed of two segments such that it is V or chevron shaped with each segment projecting from the cutting blade support in a substantially helical pattern. The cutting blade is supported on a rotatable axle and is geared to rotate in conjunction with a drive drum which includes a V or

chevron shaped slot therein which interfaces with the cutting blade. The cutting blade itself is shielded from the remainder of the dispenser by means of a fixed cowl which, in combination with the dispenser cabinet and the drive drum, blocks all access to the blade even when the dispenser is opened for maintenance purposes to insert a fresh roll of paper towels. A pair of guide rollers are rotatably mounted adjacent the drive drum. Each of the guide rollers and the drive drum include annular slots. A threading clip is attached to each guide roller at these annular slots with each threading clip extending from one guide roller around the drive drum to the other guide roller. The threading clips ensure that the paper towel when first inserted into the overall mechanism will be routed correctly through the drive drum/blade/guide roller assembly. The threading clips also ensure proper tensioning of the web through the mechanism which is necessary for cutting the web.

A braking mechanism is provided which relies on a cam mounted to the gear of the cutting blade. As the cutting blade is rotated, the cam drives the cam follower which lifts a spring loaded piston placing a travel stop temporarily in the path of a projection from one side of the gear. The projections ram the travel stop and the shock is absorbed by springs. The brake mechanism thus ensures that the rolled towel cannot be free spooled by a user of the dispenser. The brake mechanism also creates a positive stop of the rotation of the web roll to allow a user to break the tabs connecting the sheet to the remainder of the roll after the cut has been made.

The dispenser of the present invention is designed to be a no-run-out dispenser and includes supports therein for both a primary roll and a stub or remnant roll of towel. Geared sensor arms are provided which sense the diameter of the stub or remnant roll. As the diameter of that roll decreases such that it has only a few linear feet of towel left thereon, the tail from the primary roll is automatically delivered to the surface of the drive drum and the proximity of the upper guide roller and the paper is automatically threaded therethrough.

To dispense a rolled towel product from the dispenser of the present invention, the user need merely grasp the tail of the towel extending from the dispenser and pull downward. This action drives the drive drum which in turn rotates the cutting blade into position severing the sheet at the proper location. Because the blade is spring loaded, the user is pulling against the force of the spring to the point at just before where the cut is begun. At that point, the spring unloads helping with the cut and kicking out a tail for the next towel to be grasped.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a front elevational view of the dispenser of the present invention with the front housing in the open position.

Figure 2 is a partially cutaway perspective view of the rear housing with the dispensing mechanism removed therefrom.

Figure 3 is an exploded perspective view of the dispensing mechanism.

Figure 4 is a partially cutaway perspective view of the side panels mounted in the rear housing.

Figure 5 is a plan view of the cutting blade holder.

Figure 6 is an outside face side elevation of the left side plate.

Figure 7 is an inside face side elevation of the left side plate.

Figure 8 is an outside face side elevation of the right side plate.

Figure 9 is an inside face side elevation of the right side plate.

Figure 10 is a plan view of a guide roller (typ.).

Figure 11 is a side elevation of a first rocker arm (typ.).

Figure 12 is a side elevation of a second rocker arm (typ.).

Figure 13 is a side elevation of the shock absorbing member.

Figure 14 is an inside face side elevation of the piston.

Figure 15 is an outside face side elevation of the piston.

Figure 16 is a front elevation of the piston.

Figure 17 is a side elevation of the spur gear from the jumping cam thereof.

Figure 18 is a detail drawing of a guide clip.

Figure 19 is a front elevation of the crank.

Figure 20 is a side elevation of the hand wheel.

Figure 21 is a plan view of the drive drum with the tubular members removed therefrom.

Figure 22 is a perspective view of the drive drum.

Figure 23 is a top plan view of the blade cover.

Figure 24 is a rear elevational view of the blade cover taken along line 24-24 of Figure 23.

Figure 25 is a side elevational view of the blade cover taken along line 25-25 of Figure 23.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning first to Figures 1 and 2, there is shown the no-touch roll towel dispenser 10 of the present invention which includes a rear wall 12 for mounting to a vertical supporting surface such as a lavatory wall. Extending from rear wall 12 are top wall 14, bottom wall 16, and side walls 18. Rear wall 12, top wall 14, bottom wall 16 and side walls 18 form a rear housing 20. Pivotally connected to rear housing 20 is door or front housing 22. The dispensing slot 24 is located toward the bottom of door 22.

Referring specifically to Figure 2, there is shown the rear housing 20 of the present invention with the door 22 removed therefrom. Mounted within the upper portion of dispenser 10 are left primary roll holder 25 and right primary roll holder 26 which supports the primary roll of towel (not shown). Left primary roll holder 25 is pivotally mounted with leaf springs 27 biasing it away from left side wall 18. Right primary roll holder 26 extends telescopically from bracket 29 attached to right side wall 18. Bracket 29 slidably engages right side wall 18 by means of rails 31. A coil spring biases right primary roll holder 26 toward left primary roll holder 25. Extending from primary roll holder 25 is positioning arm 33. Positioning arm 33 is contacted by the inside surface of front housing 22 when front housing 22 is closed on rear housing 20. Thus, the left side of the primary roll of towel is always set in the same place allowing primary roll holder 26 to float depending on the width of the roll being dispensed. In such manner, the primary roll

holders 25, 26 automatically adjust to support roll of varying width. Mounted below primary roll holders 26 are left side plate 30, right side plate 32, and blade cover or cowl 34, which interconnect with one another to form a frame for supporting the dispensing mechanism. The frame is an interlocking-type structure which slide mounts into railings 37 extending from the inside of rear housing 20 (see Figure 2). Catches 39 are provided to snap-fit or lock the frame in place. Blade cover or cowl 34 includes a notch 35 on each side thereof.

Left side plate 30 and right side plate 32 (see Figures 3, 4, and 6 through 9) each include a bore 38 therethrough. There is a cutting blade support member 40 (see Figures 3 and 5) which extends from the left side plate 30 to right side plate 32. Cutting blade support member includes a journal 42 extending from each end thereof. Journals 42 reside in journal bearings 38 such that cutting blade support member 40 is rotatably supported. Extending from cutting blade support member 40 are the two segments of cutting blade 44. Cutting blade support member 40 includes a plurality of opposing fingers 45 which are offset from one another. Cutting blade 44 is held between opposing fingers 45 of cutting blade support member 40 in such manner that cutting blade 40 projects from cutting blade support member 40 in two spiraled segments to form a generally flat chevron or V-shape. (Note that fingers 45 are shown in greater detail in Figure 5 than in Figure 3.) The segment of cutting blade 44 includes a plurality of teeth 46 arranged in groups of three. Cutting blade 44 also includes a plurality of slots 48 which are located between adjacent groups of three teeth and which provide clearance between the blade 44 and the threading clips 74 (shown in Figure 18) during rotation of the cutting blade. The greater the number of teeth 46 extending from cutting blade 44, the greater the force needed to cut the web and smoother is the line of cut imparted to the web. A lesser number of teeth 46 results in a lower force needed to make the cut, but also results in a more jagged line of cut.

Cutting blade 44 includes a bend 50 therein angling the teeth 46 in the direction in which cutting blade support member



40 rotates, that being in the direction of the travel of the web through the dispenser 10. The angle of bend 50 in cutting blade 44 is preferably about 27°. Angling of the blade is preferred for dispensing operation. However, such a bend 50 in the blade 44 may have a tendency to cause jamming of the dispenser during threading of a new roll through the mechanism. To reduce the potential for jamming during threading it is preferred that there be no bend 50 in the blade 44.

Spaced away from journal bearings 38 in left and right side plates 30, 32, and extending inwardly therefrom are journal bearings 52. There is a drive drum or roller 54 which has a drive roller journal 56 extending from each end thereof. (See Figures 1, 3, 21, and 22.) Each drive roller journal 56 rotatably resides within a journal bearing 52. Drive drum or roller 54 includes a plurality of annular slots 58 therein. A plurality of stripping fins 55 (see Figure 1) extend from the bottom of door 22. When door 22 is closed, stripping fins 55 extend into annular slots 58 ensuring that as the web is taken around drive drum 54, it is removed therefrom at the proper point and caused to exit the dispensing slot 24. Stripping fins 55 thus obviate dispensing jams that can occur when the web fails to exit the dispenser and continues to wrap around the dispensing drum. Drive roller 54 includes a plurality of tubular members 60 which preferably attach by a snap fit arrangement. Affixed to the outside of each tubular member is a friction surface to minimize slipping of the web as it travels about the periphery of the drive drum 54. The friction surface 60 is preferably a relatively dense elastomer. Each tubular member 60 should be capable of locking into a single orientation on drive drum 54.

Extending from the inside surfaces of left and right side plates 30, 32 are upper brackets 62 and lower brackets 64. Each of the upper brackets 62 and lower brackets 64 includes a slotted opening 66. Residing between upper brackets 62 and supported thereby is upper guide roller 68. Residing between lower brackets 64 and supported thereby is lower guide roller 70. Upper guide roller 68 and lower guide roller 70 each have a

plurality of annular grooves 72 therein (see Figure 10). The annular grooves 72 in upper and lower guide rollers 68, 70 are in alignment with each other. Guide clips 74 (See Fig. 18; not shown in Figure 3) attach to upper and lower guide rollers 68, 70 at annular grooves 72 with each guide clip extending about the outside of drive roller 54. Guide clips 74 are preferably made of steel and gently bias upper and lower guide rollers toward drive roller 54. Each guide clip 74 extends from upper guide roller 68 to lower guide roller 70 wrapping about the outside of drive roller 54 in the direction of rotation of drive roller 54. Preferably, the gap between guide clips 74 and friction surface 60 is in the range from about 1/16" to about 1/8". The guide clips 74 guide the web in the proper path around drive roller 54 during threading. The nips between the drive roller 54 and the upper and lower guide roller 68, 70 maintains the web in tension as it traverses the periphery of the drive roller 54. This tension is important to ensure that the web is cut or perforated by blade 44 entering slot 76. The blade 44 enters slot 76 to cut the web when the rotation of drive roll 54 has positioned slot 76 such that it is located between upper and lower guide rollers 68, 70 along the path of the web. Without such tension the web may merely be pushed into slot 76 and remain uncut. The annular grooves 72 in upper and lower guide rollers 68, 70 are preferably wide enough to allow the guide clips 74 to fit therein without pressing against the sides of the grooves. The intent is to reduce frictional forces between the guide clips 74 and the upper and lower guide rollers 68, 70 which, in turn, reduces the force necessary to rotate upper and lower guide rollers 68, 70. In such manner, the guides clips will not significantly increase the drag forces on the web as it is drawn through the mechanism of the dispenser 10. However, a loose fit between the guide lips 74 and the annular grooves 72 may allow the clips to cant such that the plane in which a guide clip 74 resides is no longer perpendicular to the axes of rotation of the upper and lower guide rollers. If the guide clips 74 shift to too great a degree in annular grooves 72, the guide clips 74 may go out of alignment with slots 48 in blade 44 causing an interference between the

blade 44 and the guide clips 74. This situation is obviated by guide clip positioners 75 which are preferably integrally formed with blade cover 34. Guide clip positioners 75 each include a notch 77 into which a portion of a respective guide clip 74 inserts. Each guide clip 74 is thereby supported at three points and is thus not subject to any significant wobble or canting.

Drive roller 54 has a chevron or V-shaped slot 76 therein which is actually comprised of non-linearly aligning (spirally aligning) slots in each of the tubular members 60. There is a drive gear 78 which attaches to a drive roller journal 56 on the left side of the drive roller 54 on that portion of the drive roller journal 56 which extends beyond left side plate 30. Drive gear 78 meshes with spur gear 80 which is affixed to the journal 42 and extends beyond left side plate 30. The ratio of the drive gear 78 to the spur gear 80 is such that for every two rotations of drive drum 54, cutting blade support member 40 rotates once with cutting blade 44 inserting into chevron shaped slot 76.

The dispenser 10 of the present invention also includes an automatic transfer mechanism which automatically feeds the tail from primary roll (not shown) to the nip between drive roller 54 and upper guide roller 68 when stub roll (not shown) is almost spent. Stub roll 84 is supported on stub roll brackets 86 extending from left and right side plates 30, 32. The automatic transfer mechanism includes a pair of first rocker arms 88, one of such first rocker arms 88 being located at each end of cutting blade support member 40. Referring to Figure 11 for detail of first rocker arms 88, each first rocker arm 88 includes a sensor support member 90 and a gear member 92. There is a journal bearing 94 located substantially at the intersection of sensor support member 90 with gear member 92. Each gear member 92 includes a plurality of gear teeth 96 on the distal end thereof. Extending across sensor support members 90 and affixed thereto is sensor rod 98. Rotatably mounted on sensor rod 98 is sensor roller 100. Each sensor support member 90 has a prong 99 extending therefrom. There is a bracket 101 extending from the inside surface of left and right side panels 30, 32 in general alignment with prongs 99. Projecting from brackets 101 toward

prong 99 is a second prong 103. Coil springs 105 fit over prongs 99, 103 and extend therebetween to thereby bias sensor support members 90 and sensor rod 98 toward stub roll 84. A U-bracket 107 may be provided on the inside surface of left and right side panels 30, 32 to ensure that coil springs 105 remain properly aligned. Sensor support members 90 extend through blade cover 34 at notches 35. Sensor roller 100 is free to rotate on sensor rod 98 and thus reduces drag on the web generated by the force of coil springs 105 biasing the sensor support members 90 and the sensor rod 98 toward the stub roll.

Automatic transfer mechanism also includes second rocker arms 102. Looking at Figure 12 for detail, each second rocker arm 102 includes a transfer rod support member 104, a geared surface 106 and a journal bearing 108. Second rocker arms 102 are supported on pins 110 extending from the inside surfaces of left and right side plates 30, 32. There is a transfer rod 112 which is affixed at each end to one of the transfer rod support members 104. Rotatably supported on transfer rod 112 is transfer roller 114. Transfer roller 114 rotates freely on transfer rod 112 and thus reduces drag on the web at the nip between the transfer rod/transfer roller 112, 114 and the drive roll 54. Transfer roller 114 includes an annular projection 116 which aligns with the annular slot 58 located substantially at the midpoint of drive roller 54, and the annular groove 72 located substantially at the midpoint of upper guide roller 68. There is a channel bracket 118 attached to transfer rod 112 extending around transfer roller 114. Projecting from channel bracket 118 is a pin 120. When the primary roll is first loaded, the tail of the primary roll is taken beneath upper guide roller 68, wrapped partially thereabout and impaled on pin 120. The geared surfaces 106 of second rocker arms 102 mesh with the gear teeth 96 of the first rocker arms 88.

The automatic transfer system operates such that coil spring 105 bias sensor support members 90 and sensor rod 98 to pivot about journal bearings 94 to thereby maintain sensor roller 100 in contact with the outside surface of stub roll 84 which is supported by stub roll brackets 86. As stub roll 84 is

depleted, the concomitant rotational movement of sensor support members 90 results in rotational movement of gear members 92. With gear teeth 96 intermeshing with geared surface 106 of transfer rod support member 104, rotational movement is also imparted to second rocker arms 102 pivoting about journals 108. Thus, as the stub roll 84 is depleted, transfer rod support member 104 is driven closer toward the nip between drive roller 54 and upper guide roller 68. When stub roll 84 is nearly spent, transfer roller 114 is pressing the tail of the primary roll against drive roller 54 in close proximity to the nip between drive roller 54 and upper guide roller 68. Annular projection 116, which aligns with the center annular slot 58 on drive roller 54 and with the center annular groove 72 on upper guide roller 68, actually enters into such slot 58 and the groove 72 when stub roll 84 is sufficiently depleted. This action ensures that the tail of the primary roll will be pinched in the nip between the drive roller 54 and the upper guide roller 68 and drawn therein. Once the web is grasped by the nip, it is torn from pin 120 and dispenses simultaneously with the remaining web on the stub roll 84. When the stub roll 84 is fully spent, then the web from primary roll is dispensed alone. At that point in time when primary roll has sufficiently decreased in diameter, it can be relocated to be supported on stub roll brackets 86 with a new primary roll inserted on primary roll holders 26.

Travel stop means (not shown) should be provided to limit the amount of rotation available to first rocker arms 88 and second rocker arms 102. Over rotation could allow gear teeth 96 to disengage from geared surface 106.

The dispenser 10 of the present invention further includes a braking mechanism. The braking mechanism includes a pair of arcuate brackets 124 extending from left side plate 30. Each arcuate bracket 124 includes a retaining clip 126. Residing between arcuate brackets 124 is a shock absorbing member 128 (shown alone in Figure 13) which is adapted for intermittent rotational movement about journal 42. Shock absorbing member 128 includes a shaft 130 having a gusset 132 extending from each end thereof. Projecting perpendicularly from gusset 132 is radiused

ledge 134. Extending from one end of each radiused ledge 134 is a travel stop 136 which normally resides abutting one end of an arcuate bracket 124. Retaining clips 126 extend radially inwardly from arcuate brackets 124 adjacent to gussets 132 to prevent shock absorbing member 128 from being laterally extracted off journal 42 when shock absorbing member 128 is in an operable position. Extending from shock absorbing member 128 proximate to travel stops 136 and substantially perpendicular thereto are shanks 138. Extending out from left side plate 30 are spring supports 140 which have shanks 142 projecting therefrom. Residing between travel stops 136 and spring supports 140 are springs 144 which fit over shanks 138, 142. Residing slidably within shaft 130 is piston 148 (shown in detail in Figures 14 through 16). Piston 148 includes an elongate opening 150 therethrough, through which the journal 42 on left side of cutting blade support member 40 inserts. Projecting from one end of piston 48 substantially parallel to shaft 130 is first nipple 152. Projecting from the inside surface of shaft 130 toward and substantially colinear with the first nipple 152 is a second nipple 154. There is a piston spring 156 which resides between piston 154 and the inside surface of shaft 130 retained on first and second nipples 152, 154. Piston spring 156 is in compression thereby biasing piston 148 toward the bottom of shaft 130. Projecting from the inside surface of piston 148 is cam follower 158 (see Figures 14 and 16). Cam follower 158 works in conjunction with jumping cam 160 affixed to spur gear 80. Jumping cam 160 is eccentric having a cam surface 162 of increasing radius which is followed by cam follower 158 as cutting blade support member rotates. Cam 160 further includes a radial step 164 where the radius of cam surface 162 abruptly falls from its point of largest radius to its point of smallest radius.

Projecting from the inside surface of piston 148 proximate to the bottom thereof is brake stop 166. Extending from the outside surface of spur gear 80 is gear stop 168.

Affixed to that portion of journal 42 which extends through right side plate 32 is the proximal end 170 of crank 172. (See

Figures 3 and 19.) Projecting from the distal end of crank 172 is post 174. Extending from the outside surface of right side plate 32 is prop 176. (See Figures 3 and 8.) Extending between post 174 and prop 176 is tension spring 178.

A drive roller journal 56 which extends through right side plate 32. Affixed thereto outside of side plate 32 and inside of side wall 18 is threading wheel 180. The inside surface of threading wheel 180 has a ratchet wheel 182 projecting therefrom. There is a pawl 184 supported on post 186 extending from right side plate 32. Also extending from right side plate 32 substantially adjacent to post 186 is pawl stop 188. Pawl 184 interacts with ratchet wheel 182 to ensure that drive roller 54 can be rotated in only one direction. There is a slot 189 in bottom wall 116 through which threading wheel 180 extends allowing a user access thereto even when the front housing 22 is closed on the rear housing 20.

Under normal operation of dispenser 10, the user is presented with a tail of the paper towel projecting through dispensing slot 24 on the bottom front portion of door 22. The user grasps the towel and pulls. As the web is pulled from the dispenser around a peripheral segment of the drive roller 54, the drive roller 54 is caused to rotate resulting in the simultaneous rotation of drive gear 78. Drive gear 78 drives spur gear 80 causing cutting blade support member 40 and cutting blade 44 supported thereon to rotate. The ratio of drive gear 80 is such that for every two rotations of drive roller 54, cutting blade support member 40 and cutting blade 44 rotate once. Timing is such that for each rotation of cutting blade support member 40, cutting blade 44 is caused to insert into chevron shaped slot 76, thereby causing a series of large perforations across the web. During rotation of cutting blade support member 40 as cutting blade 44 approaches chevron shaped slot 76, tension spring 178 is loading or being stretched. Thus, the user is pulling against the force of spring 178. Slightly before the time cutting blade 44 is contacting the web and thus entering chevron shaped slot 76, crank 172 has moved approximately 180 degrees from its starting point. At that point, the tension in spring 178 aids

in driving the rotation of cutting blade support member 40, and thus, drive drum 54. As the tension in tension spring 178 is unloaded, the added force aids in the cutting blade perforating the web and simultaneously ensures that the drive drum will continue to rotate for a sufficient period to kick out an adequate length of tail for grasping by the next user. Threading wheel 180 has the primary purpose of allowing maintenance people to be able to easily thread a new web through the dispenser. Threading wheel 180 is on the outside of the dispenser in case there has been a dispensing failure such that sufficient tail has not been presented for grasping by the user. In that case, the user can use threading wheel 180 to rotate drive drum 154 to kick out sufficient tail for grasping. Ratchet wheel 182 in combination with paw 184 ensures that both drive drum 54 and cutting blade support member 40 can rotate in only one direction. This prevents tension spring 178 from inappropriately reversing the rotation of the mechanism.

The braking mechanism of the present invention prevents a user from free spooling paper toweling from the dispenser. In such manner, the user must extract towel from the dispenser in pre-determined lengths. Prior to the grasping of the tail by the user, cam follower 158 will normally be in its at rest position against cam surface 162 at the base of radial step 164. Piston spring 156 biases piston 148 downward to ensure the cam follower 158 follows cam surface 162. As cutting blade support member 40 rotates, cam 160 also rotates. The rotation of cam 160 causes cam follower 158 and thus, piston 148 to move upward within shaft 130 of shock absorbing member 128. As piston 148 moves upward, ultimately, brake stop 166 is moved into alignment with gear stop 168. When cam follower 168 reaches radial step 164, piston 148 falls abruptly within shaft 130. However, if the user is rotating the drive drum too quickly by attempting to remove towel too rapidly from the dispenser, gear stop 168 will ram brake stop 166 thereby momentarily stopping rotation of the drive drum 54 until piston 148 falls within shaft 130 such that cam follower 158 reoccupies its normal at rest position at the base of radial step 164.



The braking system of the present invention also has a shock absorbing system associated therewith. Shock absorbing member 128 is adapted for a small amount of rotation movement within and between arcuate brackets 124. Springs 144 bias shock absorbing member 128 such that travel stops 136 normally have an at rest position abutting one end of arcuate brackets 124. When a user has caused drive drum 54 and cutting blade support member 40 to rotate too quickly thereby causing gear stop 168 to ram brake stop 166, the force of the collision causes shock absorbing member 128 to rotate a small distance against the force of springs 144 thereby absorbing the shock of the collision. Springs 144 quickly return the shock absorbing member 128 to its normal at rest position. Springs 144 in combination with spring supports 140 also provide rotational travel limits for shocking absorbing member 128 in the direction of rotation opposite or against the biasing of springs 144.

It is preferable that all of the enumerated elements of the present invention be made of molded plastic with the exception of the various springs, as well as guide clips 74, cutting blade 44 and friction surface 60 of drive roller 54. Upper and lower guide rollers 68, 70 are preferably made of wood.

It should be recognized that cutting blade 44 is inaccessible by a user of the dispenser 10 and further, is inaccessible even by maintenance personnel who open the door 22 to refill the dispenser 10. Cowl 34 in combination with drive drum 54 blocks all access to blade 44 short of removing frame 36 from the dispenser 10. Even rotation of hand or threading wheel 180 while the door 22 is open will not put blade 44 in an accessible position. This negates the possibility of having a user or a maintenance person replacing a spent roll of towel from accidentally cutting or chopping a digit.

Cutting blade 44 is preferably in a chevron or flattened V-shape in order to ensure that teeth 46 do not contact the tail of the towel at the same time. If all of the teeth 46 were to contact the web at the same time, the force necessary to pull the towel through the dispenser would increase, and further, would promote the towel being pushed into slot 76 rather than being

perforated by teeth 46. Cutting blade 44 could also be one continuous spiral rather than V-shaped but then the cut or tear line through the web would have a displeasing angle.

From the foregoing, it should be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth together with other advantages which are inherent to the apparatus.

It will be understood that certain features and subcombinations are of utility and may be employed with reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth were shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A roll towel dispenser for delivering and severing sheets of web from a roll of towel comprising:

- (a) a rear housing;
- (b) a front housing pivotally connected to said rear housing, said front housing being closable on said rear housing to form a compartment;
- (c) a dispensing slot through said front housing;
- (d) means for supporting the roll of towel in said compartment;
- (e) a frame mounted within said compartment;
- (f) a drive roller rotatably supported on said frame, said drive roller having a slot therein;
- (g) a cutting blade support member rotatably supported on said frame substantially parallel to said drive roller and located more rearward in said compartment than said drive roller, said cutting blade support member having a cutting blade extending therefrom, said frame and said drive roller blocking access to said cutting blade even when said front housing is in an open position from said lower housing;
- (h) an upper guide roller supported by said frame and a lower guide roller supported by said frame, said upper guide roller forming a first nip with said drive roller, said lower guide roller forming a second nip with said drive roller, said drive roller being driven by the action of a user pulling on a tail of the roll of towel passing through said first and second nips and extending through said dispensing slot;
- (i) a drive gear attached to said drive roller;
- (j) a spur gear attached to said cutting blade support member, said spur gear meshing with said drive gear such that for every two rotations of said drive roller said cutting blade support member rotates once with said cutting blade inserting into said slot to perforate the web allowing the user to separate a sheet of the web from the roll of towel.

2. An automatic threading mechanism for threading a roll web through a roll web dispenser, the roll web dispenser including

a frame having a drive roller, an upper guide roller and a lower guide roller rotatably supported thereon, the upper guide roller and the lower guide roller forming first and second nips with said drive roller, said automatic threading mechanism comprising:

(a) a plurality of annular grooves in the upper guide roller and a plurality of annular grooves in the lower guide roller, said annular grooves in the upper guide roller aligning with said annular grooves in the lower guide roller;

(b) a plurality of guide clips attached to the upper and lower guide rollers at said annular grooves, each of said guide clips encircling a peripheral segment of the drive roller, said guide clips biasing the upper and lower guide rollers toward the drive roller.

3. An automatic transfer system for use with a roll web dispenser, the roll web dispenser including a frame having a drive roller and a guide roller supported thereon, the roll web dispenser further including means for supporting first and second rolls of web therein, the guide roller forming a nip with said drive roller, the automatic transfer mechanism automatically delivering the tail of a second roll web to the nip when a first roll is near completion, said automatic transfer system comprising:

(a) a pair of first rocker arms pivotally mounted at opposite ends of the drive roller, each of said first rocker arms including a sensor support member and a gear member;

(b) a sensing means affixed to each of said sensor support members and spanning therebetween;

(c) a pair of second rocker arms pivotally mounted to the frame at opposite sides thereof, each of said second rocker arms including a transfer rod support member and a geared surface, each of said geared surfaces meshing with one of said gear members;

(d) a transfer rod affixed to each of said transfer rod support members and spanning therebetween;

(e) means for attaching the tail of the second roll of web to said transfer rod;

(f) biasing means for biasing said sensing means against the outside surface of the first roll of web such that as the first roll is depleted, said sensing means remains in contact with the outside surface of the first roll of web, the resulting rotational movement of said first pair of rocker arms driving rotation of said second pair of rocker arms through the interaction of said geared surfaces with said gear members thereby moving said transfer rod and the tail of the second roll of web toward the nip, the tail of the second roll of web being delivered to the nip when the first roll is near completion.

4. A braking system for use with a no-touch roll web dispenser, the roll web dispenser including a frame having a drive roller, a plurality of guide rollers and a cutting blade support member all rotatably supported thereon, the cutting blade support member including a journal on each end thereof extending through the frame, the guide roller forming a nip with said drive roller, and means for supporting a roll of web within the dispenser, the roll of web having a tail which is threaded through the nip and about a peripheral segment of the drive roller, the drive roller being rotated by a user pulling on the tail of the roll of web, said braking system comprising:

(a) a spur gear affixed to the journal at one end of the cutting blade support member;

(b) a jumping cam affixed to said spur gear, said jumping cam including one radial step;

(c) a pair of brackets extending from the frame proximate to said spur gear;

(d) a shock absorbing member mounted between said brackets and adapted for intermittent, bi-directional rotational movement about the journal, said shock absorbing member including a shaft therein;

(e) spring means biasing said shock absorbing member to a normal position;

(f) a piston residing in said shaft, said piston including a slot therethrough through which the journal extends;

(g) a cam follower projecting from said piston, said cam follower interacting with said jumping cam when the cutting blade support member is rotated such that said piston is caused to reciprocate within said shaft;

(h) a brake stop extending said piston toward said spur gear;

(i) a gear stop extending from said spur gear toward said piston, said piston moving to a position wherein said brake stop is rammed by said gear stop after a predetermined length of web has been extracted by a user thereby interfering with further rotational movement of said spur gear and thereby preventing the user from causing the web to free spool from the dispenser, said jumping cam then allowing the piston to fall within the shaft moving such that said brake stop no longer interferes with gear stop allowing the user to extract another predetermined length of web.

5. A web guide system for guiding the tail of a roll of web around a peripheral segment of a drive roller in a dispenser, the web guide system comprising:

(a) an upper guide roller and a lower guide roller rotatably mounted within the dispenser, said upper guide roller and said lower guide roller forming first and second nips with the drive roller;

(b) a plurality of annular grooves in the upper guide roller and a plurality of annular grooves in the lower guide roller, said annular grooves in the upper guide roller aligning with said annular grooves in the lower guide roller;

(c) a plurality of guide clips attached to the upper and lower guide rollers at said annular grooves, each of said guide clips encircling a peripheral segment of the drive roller, said guide clips biasing the upper and lower guide rollers toward the drive roller.

6. A roll towel dispenser comprising:

(a) a rear housing;

(b) a front housing pivotally connected to said rear housing, said front housing being closable on said rear housing to form a compartment;

(c) a dispensing slot through said front housing;

(d) means for supporting a roll of towel in said compartment;

(e) a frame mounted within said compartment;

(f) a drive roller rotatably supported on said frame, said drive roller having a slot therein;

(g) a cutting blade support member rotatably supported on said frame substantially parallel to said drive roller, said cutting blade support member having a cutting blade extending therefrom;

(h) an upper guide roller supported by said frame and a lower guide roller supported by said frame, said upper guide roller forming a first nip with said drive roller, said lower guide roller forming a second nip with said drive roller, said drive roller being driven by the action of a user pulling on a tail of the roll of towel passing through said first and second nips and extending through said dispensing slot;

(i) a drive gear attached to said drive roller;

(j) a spur gear attached to said cutting blade support member, said spur gear meshing with said drive gear such that for every two rotations of said drive roller said cutting blade support member rotates once with said cutting blade inserting into said slot to perforate the tail of the roll of towel.

7. A roll towel dispenser as recited in claim 6 further comprising:

(a) a plurality of annular grooves in said upper guide roller and a plurality of annular grooves in said lower guide roller, said annular grooves in said upper guide roller aligning with said annular grooves in said lower guide roller;

(b) a plurality of guide clips attached to said upper and lower guide rollers at said annular grooves, each of said guide clips encircling a peripheral segment of the drive roller, said guide clips biasing the upper and lower guide rollers toward the

drive roller, said guide clips assisting in threading the roll towel through said first and second nips.

8. A roll towel dispenser as recited in claim 6 further comprising:

(a) a pair of first rocker arms pivotally mounted at opposite ends of said drive roller, each of said first rocker arms including a sensor support member and a gear member;

(b) a sensing means affixed to each of said sensor support members and spanning therebetween substantially to said drive roller;

(c) a pair of second rocker arms pivotally mounted to the frame at opposite sides thereof, each of said second rocker arms including a transfer rod support member and a geared surface, each of said geared surfaces meshing with one of said gear members;

(d) a transfer rod affixed to each of said transfer rod support members and spanning therebetween substantially to the drive roller;

(e) means for attaching the tail of the second roll of web to said transfer rod;

(f) biasing means for biasing said sensing means against the outside surface of the first roll of web such that as the first roll is depleted, said sensing means remains in contact with the outside surface of the first roll of web, the resulting rotational movement of said first pair of rocker arms driving rotation of said second pair of rocker arms through the interaction of said geared surfaces with said gear members thereby moving said transfer rod and the tail of the second roll of web toward said first nip, the tail of the second roll of web being delivered to said first nip when the first roll is near completion.

9. A roll towel dispenser as recited in claim 6 wherein:

said slot in said drive roller and said cutting blade are chevron shaped.



10. A roll towel dispenser as recited in claim 6 wherein:  
said cutting blade includes a plurality of teeth which have points at the distal ends thereof and which perforate the web as said teeth enter said slot in said drive roller.
11. A roll towel dispenser as recited in claim 10 wherein:  
said cutting blade is comprised of two segments, each of said segments having a transverse bend therein substantially parallel to a line containing said points of said teeth.
12. A roll towel dispenser as recited in claim 6 further comprising:
- (a) a jumping cam affixed to said spur gear, said jumping cam including one radial step;
  - (b) a pair of brackets extending from the frame proximate to said spur gear;
  - (c) a shock absorbing member mounted between said brackets and adapted for intermittent, bi-directional rotational movement about the journal, said shock absorbing member including a shaft therein;
  - (d) spring means biasing said shock absorbing member to a normal position;
  - (e) a piston residing in said shaft, said piston including a slot therethrough through which the journal extends;
  - (f) a cam follower projecting from said piston, said cam follower interacting with said jumping cam when the cutting blade support member is rotated such that said piston is caused to reciprocate within said shaft;
  - (g) a brake stop extending said piston toward said spur gear;
  - (h) a gear stop extending from said spur gear toward said piston, said piston moving to a position wherein said brake stop is rammed by said gear stop after a predetermined length of web has been extracted by a user thereby interfering with further rotational movement of said spur gear and thereby preventing the user from causing the web to free spool from the dispenser, said jumping cam then allowing the piston to fall within the shaft

moving such that said brake stop no longer interferes with gear stop allowing the user to extract another predetermined length of web.

13. A roll towel dispenser as recited in claim 6 wherein:  
said frame and said drive roller block access to said cutting blade even when said front housing is in an open position from said lower housing.

14. A roll towel dispenser as recited in claim 1 further comprising:

(a) a jumping cam affixed to said spur gear, said jumping cam including one radial step;

(b) a pair of brackets extending from the frame proximate to said spur gear;

(c) a shock absorbing member mounted between said brackets and adapted for intermittent, bi-directional rotational movement about the journal, said shock absorbing member including a shaft therein;

(d) spring means biasing said shock absorbing member to a normal position;

(e) a piston residing in said shaft, said piston including a slot therethrough through which the journal extends;

(f) a cam follower projecting from said piston, said cam follower interacting with said jumping cam when the cutting blade support member is rotated such that said piston is caused to reciprocate within said shaft;

(g) a brake stop extending said piston toward said spur gear;

(h) a gear stop extending from said spur gear toward said piston, said piston moving to a position wherein said brake stop is rammed by said gear stop after a predetermined length of web has been extracted by a user thereby interfering with further rotational movement of said spur gear and thereby preventing the user from causing the web to free spool from the dispenser, said jumping cam then allowing the piston to fall within the shaft moving such that said brake stop no longer interferes with gear

stop allowing the user to extract another predetermined length of web.

15. A roll towel dispenser as recited in claim 1 further comprising:

(a) a plurality of annular grooves in said upper guide roller and a plurality of annular grooves in said lower guide roller, said annular grooves in said upper guide roller aligning with said annular grooves in said lower guide roller;

(b) a plurality of guide clips attached to said upper and lower guide rollers at said annular grooves, each of said guide clips encircling a peripheral segment of the drive roller, said guide clips biasing the upper and lower guide rollers toward the drive roller, said guide clips assisting in threading the roll towel through said first and second nips and also, in combination with said guide rollers, maintaining tension of the web between said first and second nips for cutting of the web.

16. A roll towel dispenser as recited in claim 1 wherein:

said slot in said drive roller and said cutting blade are chevron shaped.

17. A roll towel dispenser as recited in claim 1 further comprising:

(a) a pair of first rocker arms pivotally mounted at opposite ends of the drive roller, each of said first rocker arms including a sensor support member and a gear member;

(b) a sensing means affixed to each of said sensor support members and spanning therebetween substantially to the drive roller;

(c) a pair of second rocker arms pivotally mounted to the frame at opposite sides thereof, each of said second rocker arms including a transfer rod support member and a geared surface, each of said geared surfaces meshing with one of said gear members;

(d) a transfer rod affixed to each of said transfer rod support members and spanning therebetween substantially to the drive roller;

(e) means for attaching the tail of the second roll of web to said transfer rod;

(f) biasing means for biasing said sensing means against the outside surface of the first roll of web such that as the first roll is depleted, said sensing means remains in contact with the outside surface of the first roll of web, the resulting rotational movement of said first pair of rocker arms driving rotation of said second pair of rocker arms through the interaction of said geared surfaces with said gear members thereby moving said transfer rod and the tail of the second roll of web toward the nip, the tail of the second roll of web being delivered to the nip when the first roll is near completion.

18. A roll towel dispenser as recited in claim 7 further comprising:

(a) a plurality of annular slots in said drive roller;

(b) a plurality of fins projecting from said front housing into said annular slots, said fins stripping the web from the drive drum and guiding the web to said dispensing slot.

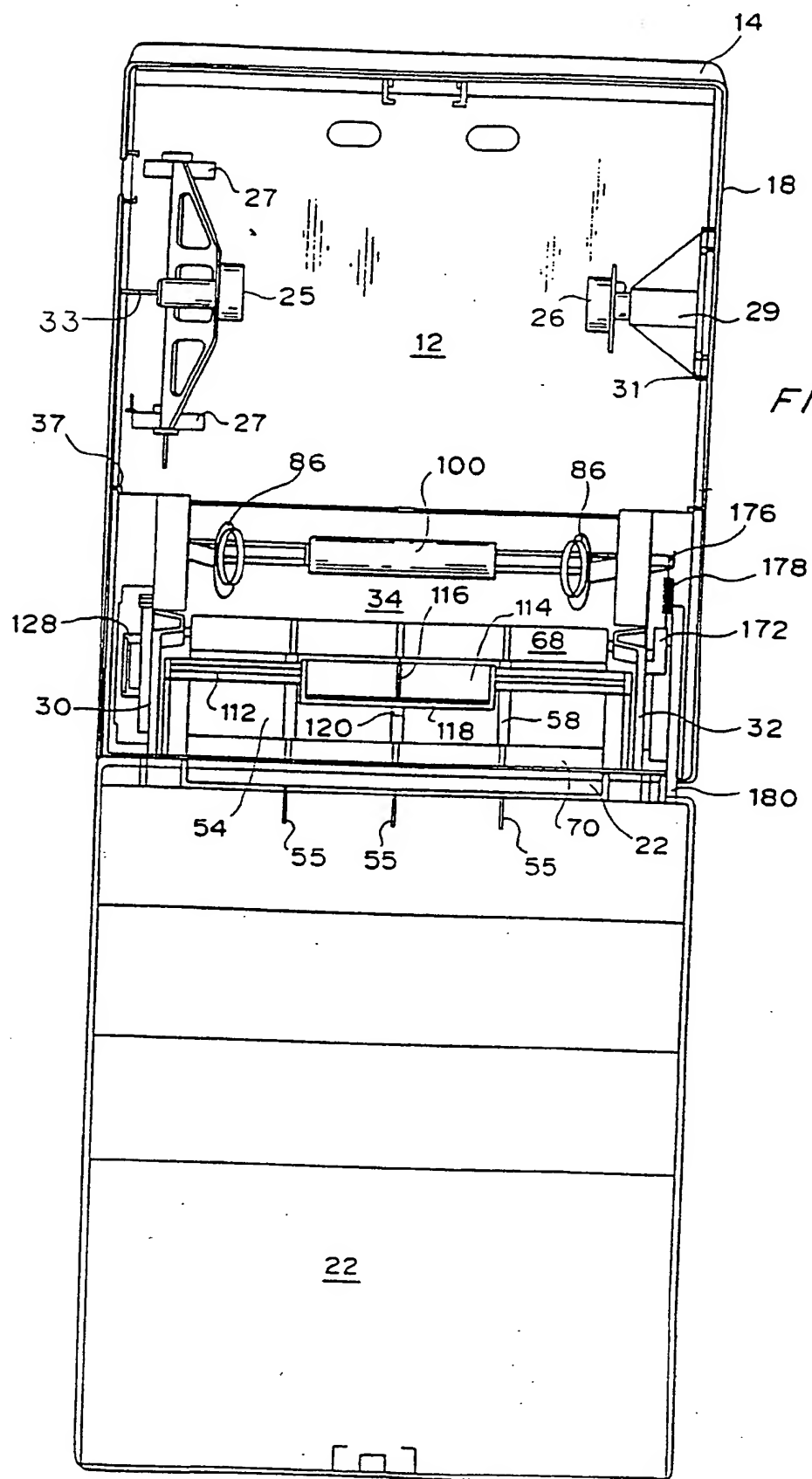
19. An automatic transfer system as recited in claim 3 wherein said sensing means includes:

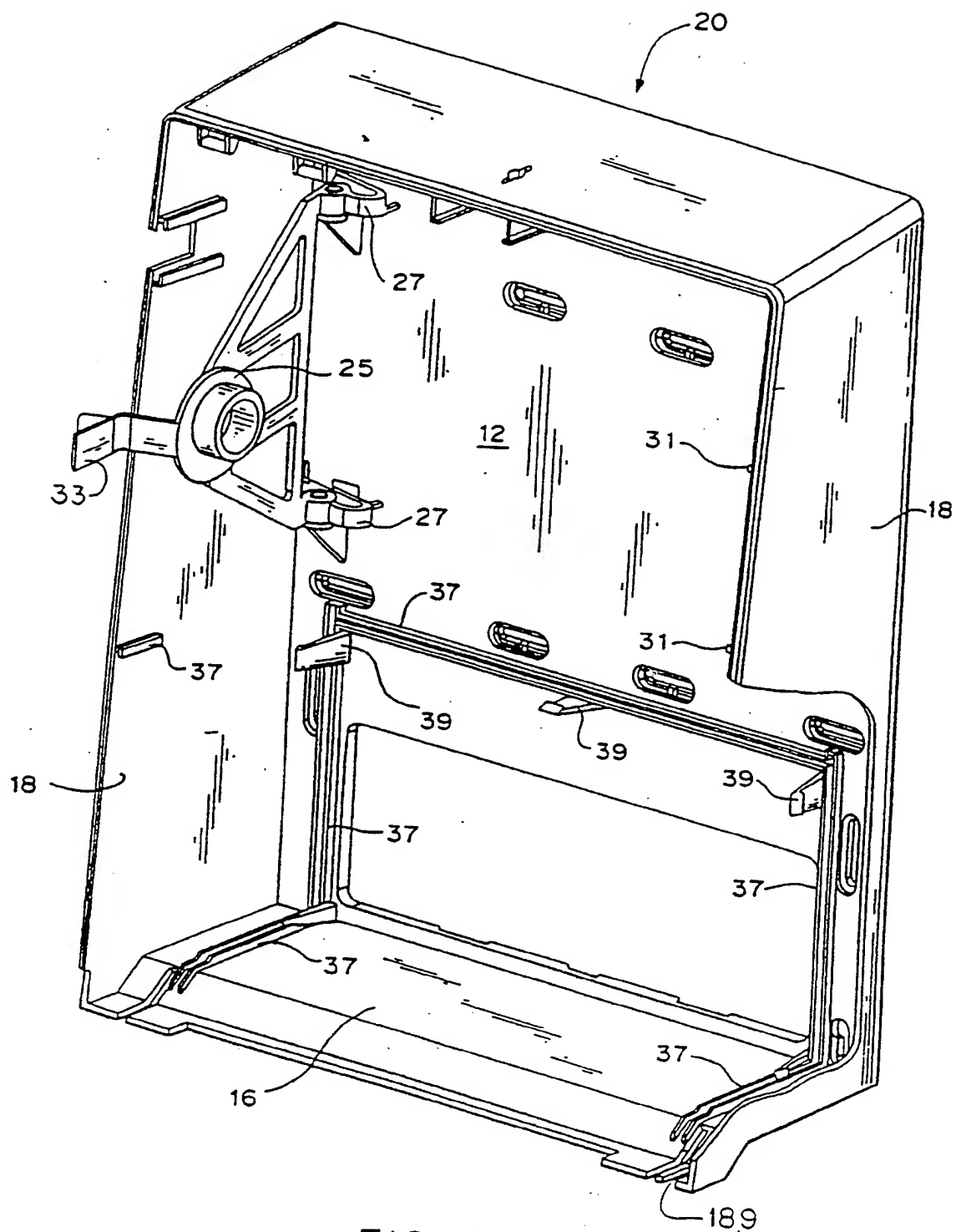
(a) a sensor rod;

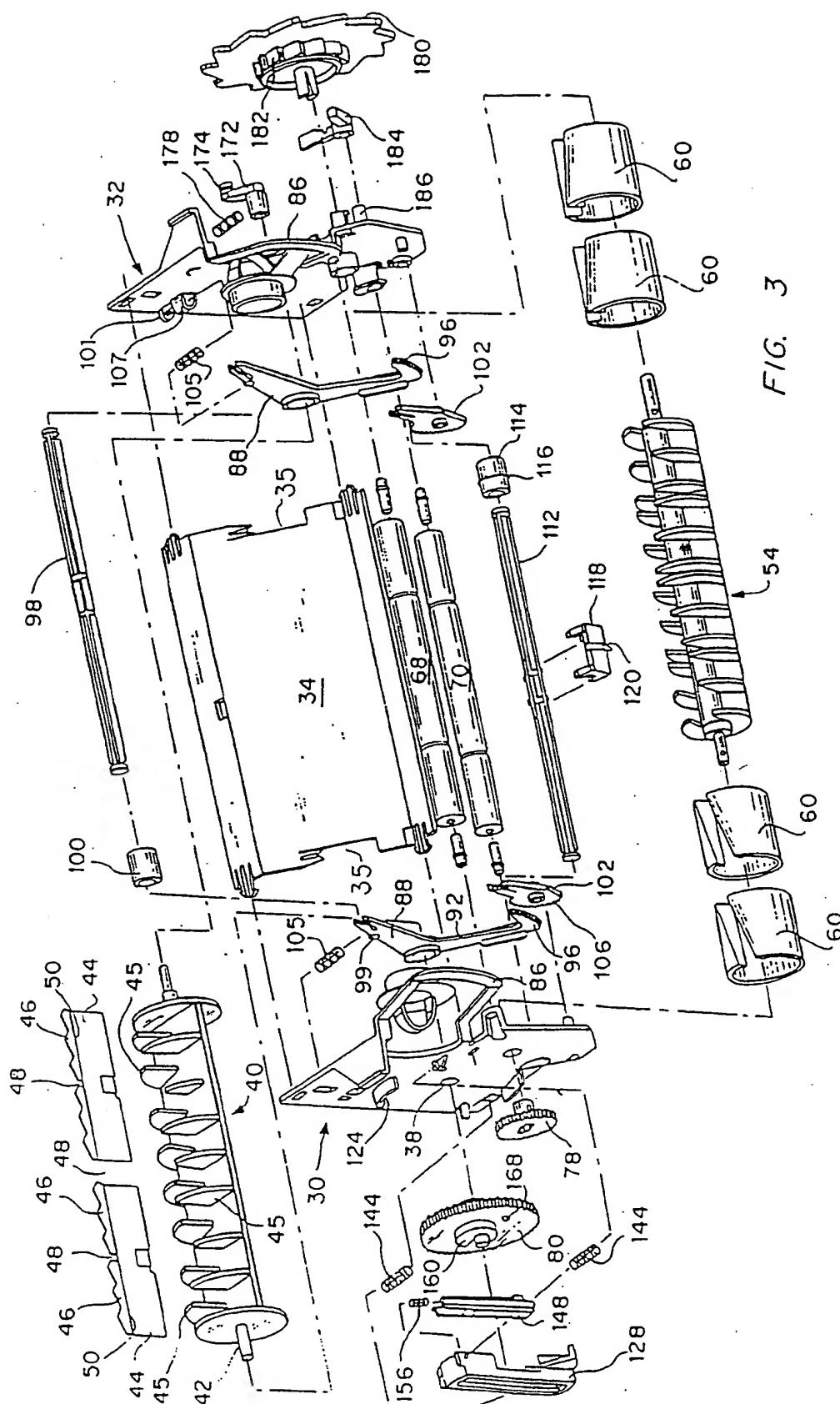
(b) a sensor roller mounted to said sensor rod, said sensor roller adapted to rotate freely on said sensor rod to thereby decrease the drag on the web as the web is drawn through the nip between said sensor roller and said drive roller.

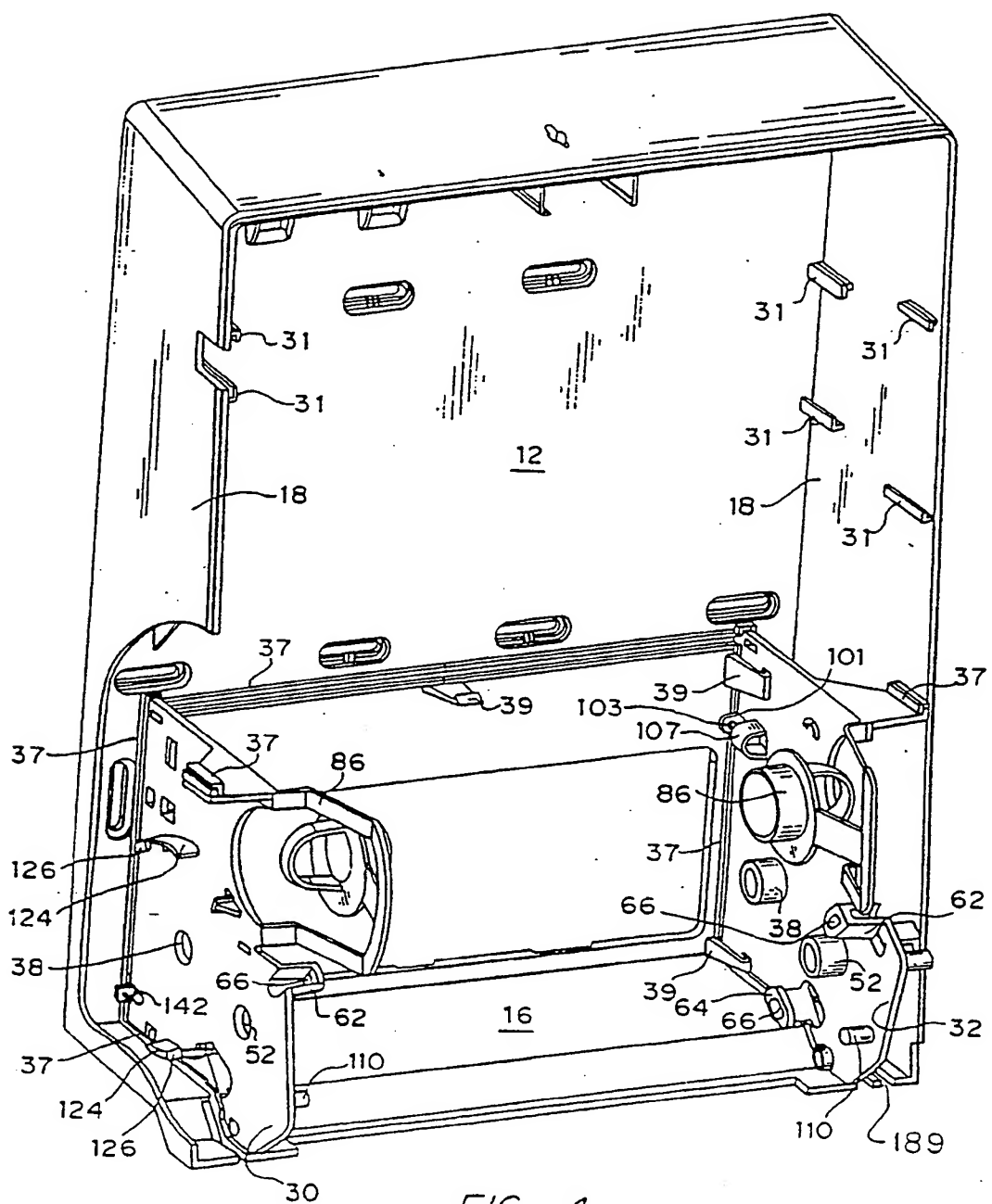
20. An automatic transfer system as recited in claim 19 further comprising:

a transfer roller attached to said transfer rod, said transfer roller adapted to rotate freely on said transfer rod to thereby decrease the drag on the web as the web is drawn through the nip between said transfer roller and said drive roller.











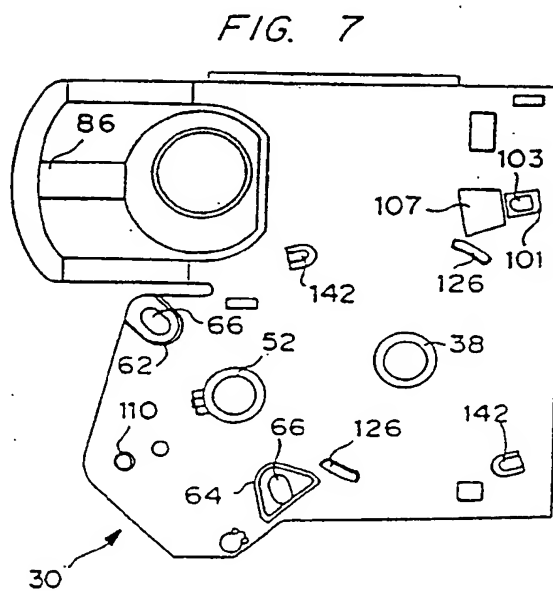
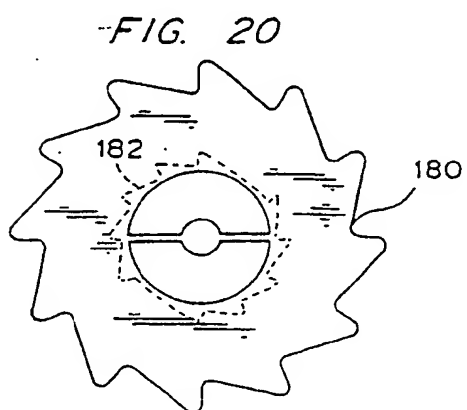
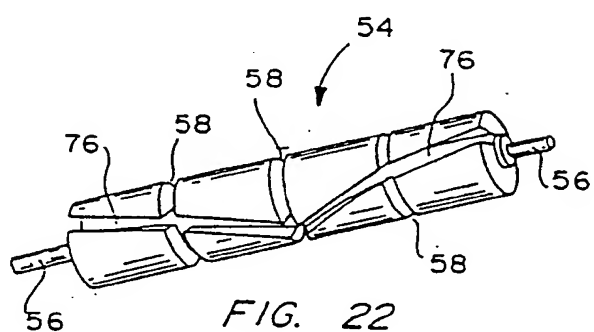
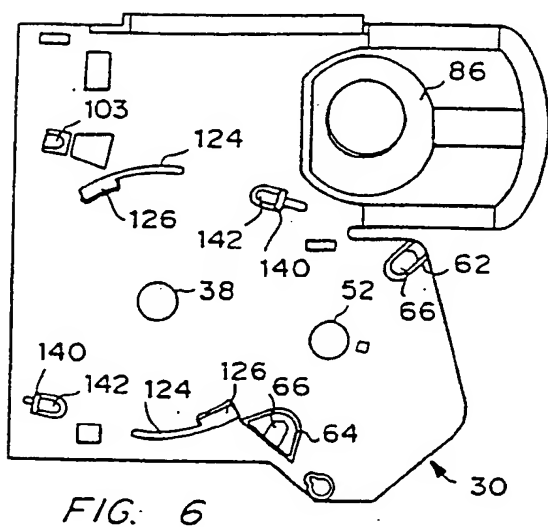
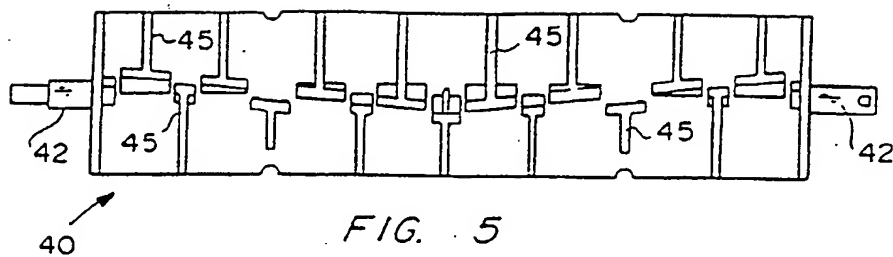


FIG. 8

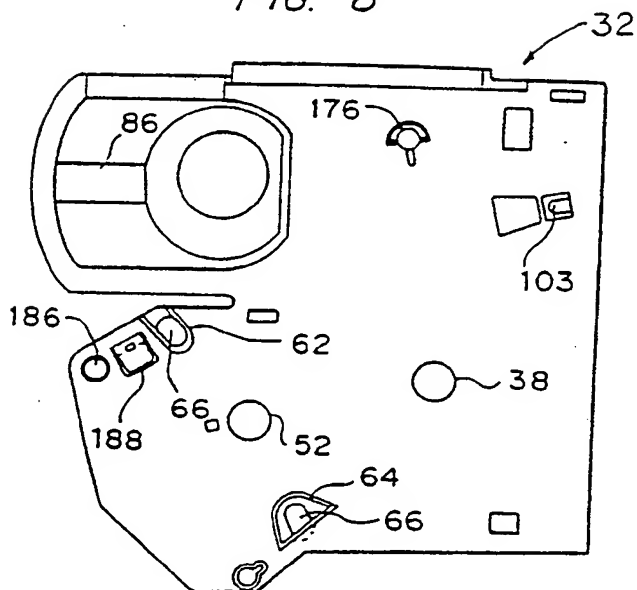


FIG. 13

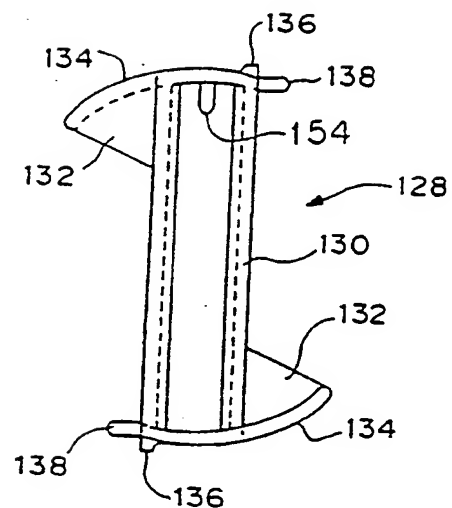


FIG. 9

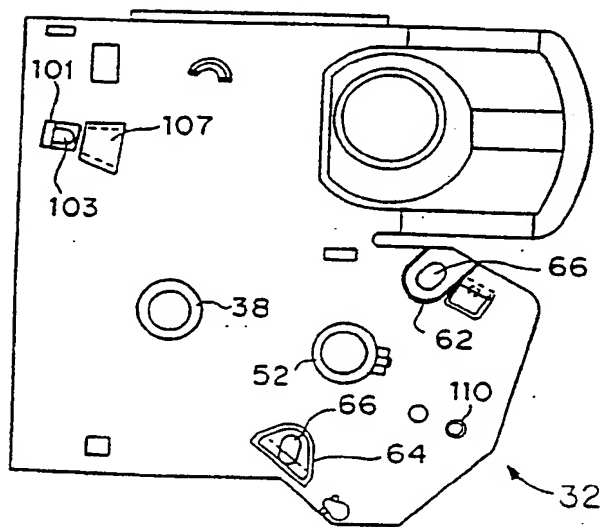


FIG. 17

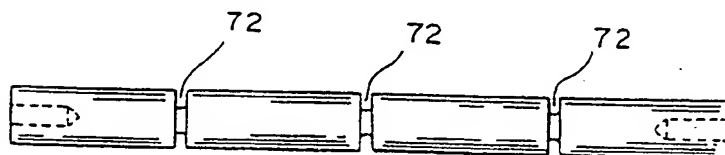
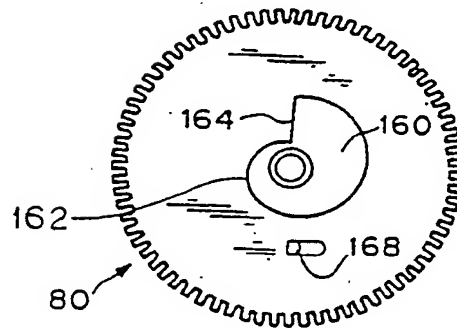
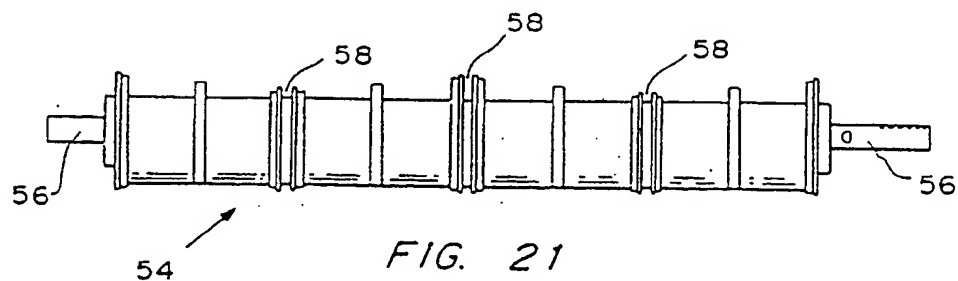
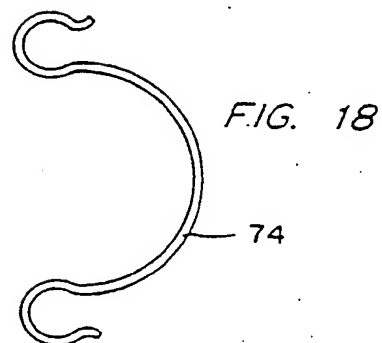
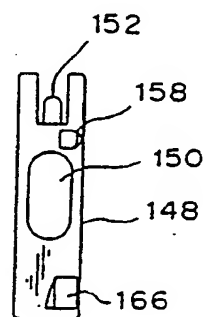
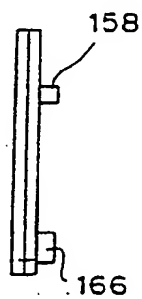
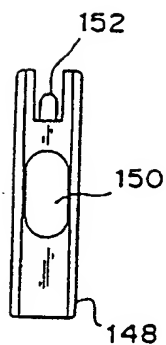
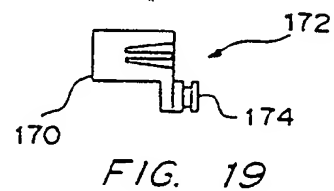
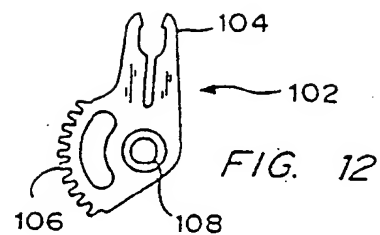
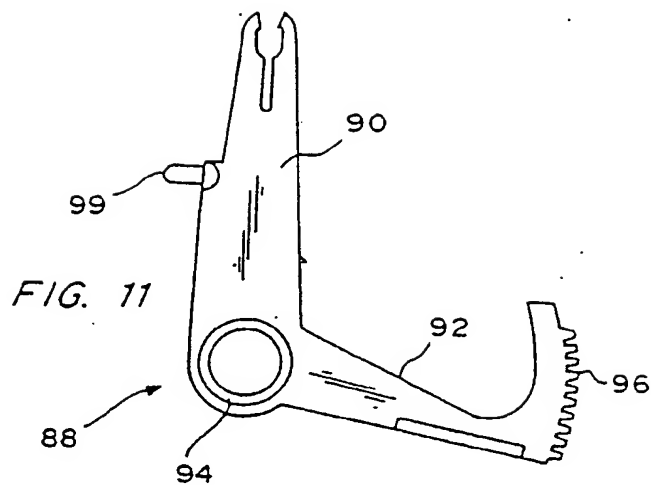
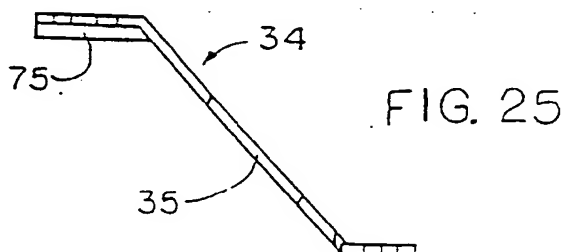
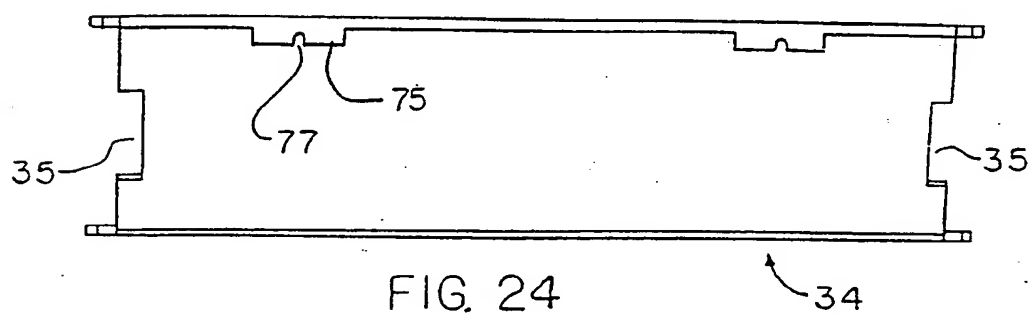
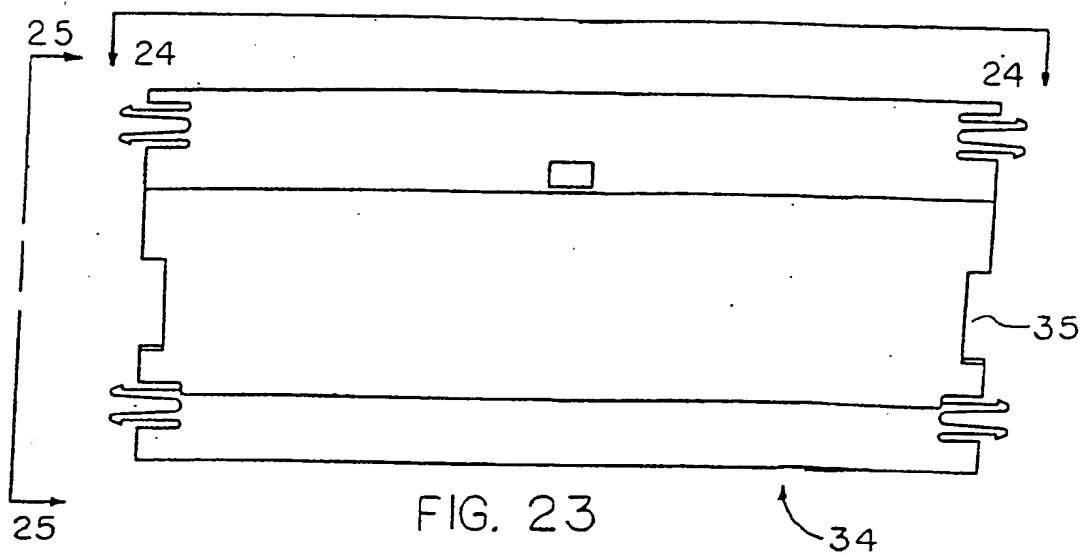


FIG. 10





## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US95/02506

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B26D 1/62

US CL : 83/335, 345, 650, 678; 242/560.1, 563.1

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 83/334, 335, 345, 649, 650, 660, 678; 242/560, 560.1, 563, 563.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US, A, 4,142,431 (JESPERSEN) 06 March 1979, see entire document	1, 6, 10, 11, 13 ----- 9, 16
Y	US, A, 4,276,797 (BAUMANN ET AL.) 07 July 1981, see Fig. 5a	9, 16
Y	US, A, 4,846,035 (GRANGER) 11 July 1989, see entire document	9, 16

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* "A"	Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier document published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"Z" document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

26 JUNE 1995

Date of mailing of the international search report

10 JUL 1995

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